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SUSQUEHANNA RIVER BASIN TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY

PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

SUSQUEHANNA COUNTY COMMISSIONERS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

Prepared by

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

For

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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AUGUST 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SUSQUEHANNA RIVER BASIN

TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY

PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

SUSQUEHANNA COUNTY COMMISSIONERS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

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5	Cutoff Trench. Profiles. Drain Plan.
8	Main Spillway and Outlet Works. Main Spillway Riser.

APPENDICES

Appendix	<u>Title</u>
A	Checklist - Engineering Data.
B	Checklist - Visual Inspection.
C	Hydrology and Hydraulics.
D	Photographs.
E	Geology.

National Dam Inspection Program.

PA-467 Dam (NDI J.D. Number

PA-ØØØ54, DER J.D. Number 58-131,

SCS I.D. Number PA-467) Susquehanna

County Commissioners

Susquehanna River Basin,

Tributary to Martins Creek,

Susquehanna County, Pennsylvania,

Phase I Inspection Report,

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam: PA-467 Dam

NDI ID No. PA-00054/DER ID No. 58-131/

SCS ID No. PA-467

Owner: Susquehanna County Commissioners

State Located: Pennsylvania

County Located: Susquehanna

Stream: Tributary to Martins Creek

Date of Inspection: 17 July 1979

Inspection Team: Gannett Fleming Corddry and

Carpenter, Inc. Consulting Engineers

P.O. Box 1963

Harrisburg, Pennsylvania 17105

Based on visual inspection, available records, calculations and past operational performance, PA-467 Dam is judged to be in good condition. The existing spillway can pass the Probable Maximum Flood (PMF) without overtopping of the dam. The spillway capacity is rated as adequate.

There is a slope stability analysis for the embankment, and it indicates that the embankment has adequate factors of safety. There is no evidence of significant problems threatening the embankment.

The following measure is recommended to be undertaken by the Owner:

(1) Remove brush from the downstream slope of the embankment and from the auxiliary spillway.

In addition, it is recommended that the Owner modify his operational procedures as follows:

- (1) Develop a detailed emergency operation and warning system for PA-467 Dam.
- (2) Provide round-the-clock surveillance of PA-467 Dam during periods of unusually heavy rains.
- (3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system pi cedures.

Submitted by:

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

FREDERICK FUTCHKO

Project Manager, Dam Section

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Date:

Approved by:

DEPARTMENT OF THE ARMY BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK

colonel, Corps of Engineers Bistrict Engineer

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Date: 25 Sep 79



PA-467 DAM

SUSQUEHANNA RIVER BASIN

TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY

PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

SUSQUEHANNA COUNTY COMMISSIONERS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

SECTION I

PROJECT INFORMATION

1.1 General.

- a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.
- b. $\underline{\text{Purpose}}$. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. The dam consists of a zoned, earthfill embankment that is 590 feet long and 52 feet high at its maximum section. The main spillway is a drop spillway located near the right abutment of the dam. It consists of a concrete riser connected to a 30-inch

diameter reinforced concrete pipe under the embankment. One 12-inch by 18-inch orifice is located on the upstream face of the concrete riser. Its crest is 38.7 feet below the design elevation of the top of the dam. The top of the riser is 17.7 feet below the design elevation of the top of the dam. A platform and trashrack are located above the riser. The outlet works is located at the main spillway. It consists of an intake and a 15-inch diameter steel pipe, which outlets into the bottom of the riser. The outlet is closed off by a steel plate bolted into place.

The auxiliary spillway is an excavated channel along the left abutment of the dam. It is a grass-lined excavation in earth. An extension of the dam embankment, referred to by the SCS as a dike, is located along the right side of the auxiliary spillway exit channel. At the control section, the auxiliary spillway has an earthen crest that is 60 feet long and 9.1 feet below the design elevation of the top of the dam and 8.6 feet above the main spillway crest. The various features of the dam are shown on the Plates at the end of the report and on the Photographs in Appendix D.

- b. Location. The dam is located on an unnamed tributary to Martins Creek, about 0.4 mile northeast of the Village of Kingsley, Pennsylvania. Because it was recently constructed, this dam does not appear on current USGS maps. The coordinates of the dam are N41°45'50" W75°44'20". The location map is shown on Plate 1.
- c. <u>Size Classification</u>. Intermediate (52 feet high, 180 acre-feet.)
- d. <u>Hazard Classification</u>. High Hazard. Downstream conditions indicate that a high hazard classification is warranted for PA-467 Dam.
 - e. Ownership. Susquehanna County Commissioners.
 - f. Purpose of Dam. Flood Control.
- g. Design and Construction History. PA-467 Dam was planned under an agreement between the Susquehanna County Commissioners (SCC-Owners) and the Soil Conservation Service of the U.S. Department of Agriculture (SCS). Land acquisition and operation and maintenance were to be provided by the SCC. The dam was designed by the SCS in 1964. The permit to construct the dam was issued in 1965, and construction was started in May, 1966. The Contractor

was Wright Griffin, Inc., LeRaysville, Pennsylvania. Construction was under the supervision of Mr. Jesse Evans, Contracting Officer for SCC. The dam was completed in September, 1967.

h. Normal Operational Procedure. The reservoir is normally maintained at the crest of the main spillway orifice. The bolted-plate closure on the outlet works is normally left in place.

1.3 Pertinent Data.

a.	Drainage Area. (square miles)	0.80
b.	Discharge at Damsite. (cfs) Maximum known flood at damsite	Unknown
	Spillway capacity: Orifice with pool at crest of main spillway riser. Main spillway with pool at crest of auxiliary spillway. Auxiliary spillway with pool at top of dam (design computations)	40 108 5,340
с.	Elevation. (feet above msl) Top of dam (design) Maximum pool Normal pool (crest of main spill- way orifice Upstream invert outlet works Downstream invert outlet works Streambed at toe of dam	1237.0 1237.0 1198.3 1188.3 1185.4 1185.4
d.	Reservoir Length. (miles) Normal pool Maximum pool	0.06 0.19
е.	Storage. (acre-feet) Normal pool Maximum pool	4 180
f.	Reservoir Surface. (acres) Normal pool Maximum pool	0.8
g.	Dam. Type	Zoned earthfill

Dam. (Cont'd.) g. Length (feet) 590 Height (feet) 52 18 Topwidth (feet) Side Slopes Upstream 1V on 3H. with 10foot berm at El. 1198.3. 1V on 2.5H. Downstream Clayey soils Zoning in upstream zone. Silty sands and gravels in middle zone. Silty gravel in downstream zone. Cutoff Impervious fill in cutoff trench. None Grout Curtain h. Diversion and Regulating Tunnel. None Spillways. i. Main (Principal or Service) Spillway. Drop spillway. Type Vertical

rectangular

riser
2.5 feet
by 7.5
feet,

i. Spillways. (Cont'd.)

with rounded crest; one 1-foot high by 1.5-foot long orifice located in face of riser. Riser connects to a conduit.

Length of Weir (feet) Orifice

One at 1.5

Riser

0

Two at 7.5 each.

Crest Elevation Orifice Riser crest

1198.3

Upstream Channel

Reservoir; a platform is 1.92 feet above the riser.

Conduit Type

Reinforced concrete pipe; 2.5 feet in dia. on concrete cradle.

i. Spillway. (Cont'd.)

1

spillway. (cont.d.)	
Length (feet)	286.0
Elevation Upstream invert at riser Downstream invert	1188.3 1185.4
Downstream Channel	Impact basin at natural stream.
Auxiliary (Emergency) Spillway Type	Grass- lined earthen cut with 1V on 2H side slopes.
Length of Weir (feet)	60 at earthen control section.
Crest Elevation	1227.9
Upstream Channel	Grass- lined channel to reser- voir.
Downstream Channel	Grass- lined channel extending to over- bank

j. Regulating Outlets. Type

Steel
pipe,
15-inch
dia.
extending
to main
spillway
riser.

Length (feet).

56

Closure

C

Boltedplate in riser at downstream end of steel pipe.

Access

Hatch in platform above main spillway riser.

ENGINEERING DATA

2.1 Design.

- a. <u>Data Available</u>. Almost complete design data are available. A summary of the available data is in Appendices A and C.
- Design Features. The dam and appurtenances are described in Paragraph 1.2a. The design features are shown on the Plates at the end of the report and on the Photographs in Appendix D. Modifications to the original design that were performed during construction are included in Appendix A. The embankment is shown on Plates 2, 3, 4, and 5, and on Photograph A. A plan of the foundation drain is shown on Plate 6. The centerline of the cutoff trench is parallel to the axis of the dam and is 55 feet upstream from the axis. The cutoff trench extends from Station 1+63 to Station 6+14, where the embankment fill intersects natural ground. The cutoff trench has 1V on 1H side slopes except for a 50-foot reach in the vicinity of the main spillway outlet conduit, where the cutoff trench side slopes are 1V on 4H. The bottom width of the cutoff trench is 12 feet throughout its length.

The main spillway riser is shown on Plates 7 and 8 and on Photographs A and B. The impact basin is shown on Plate 7 and Photograph C. The auxiliary spillway is shown on Plates 2, 3, and 5 and on Photographs D, E, and F.

c. <u>Design Considerations</u>. Although the main spill-way design has been used successfully by the SCS for many years, it appears that the entrance to the conduit could possibly develop cavitation during certain flow conditions. Other design considerations are discussed in Sections 5 and 6.

2.2 Construction.

a. <u>Data Available</u>. Construction data available consists of the construction specifications, construction photographs, and reports from both the resident inspector and from the periodic construction inspections by the

Commonwealth. A review of these data revealed no adverse comments from the resident inspector or the Commonwealth inspector. Data showing modifications to the original design are in Appendix A.

- b. <u>Construction Considerations</u>. The available information indicates that the dam is well constructed.
- $\frac{2.3}{\text{Dyeration}}$. Based on reports of annual inspections made by SCS since the dam was completed, it appears that all structures have performed satisfactorily.

2.4 Evaluation.

- a. Availability. Engineering data were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER), and by the SCS. One of the Susquehanna County Commissioners was available for information during the visual inspection.
- b. Adequacy. The type and amount of design data and other engineering data are good. The assessment is based on the combination of design data, visual inspection, and performance history.
- c. Validity. There is no reason to question the validity of the available data.

VISUAL INSPECTION

3.1 Findings

- a. General. The overall appearance of the dam is good with a few deficiencies as noted herein. The locations of deficiencies are shown in Appendix B on Plate B-1. Survey data acquired during this inspection are presented in Appendix B. Datum for the survey was assumed at the design elevation of the end sill of the impact basin, El. 1185.39. Since the impact basin is founded on soil, some settlement might have occurred, which would result in surveyed elevations being higher than the actual. On the day of the inspection, the pool was 0.1 foot above the crest of the orifice in the main spillway riser.
- b. Embankment. The embankment is in good condition. The upstream slope has a grass cover and the downstream slope is covered with crownvetch (Photograph A). The vegetal cover is in excellent condition. Surveys performed for this inspection indicated that while both the measured top of dam elevation and the auxiliary spillway crest elevation differ from design values, the relative difference between them is approximately the same. The surveys also showed that the embankment slopes have only minor deviations from the design values. One 4-inch diameter tree was growing on the downstream slope (Photograph A). A communications line, apparently used in connection with a radio system, crosses the top of the dam near the spillway (Photograph A). The line was about 6 feet higher than the top of the dam.
- c. Appurtenant Structures. The outlet works was submerged and could not be inspected. The bolted closure at the downstream end of the outlet works conduit, which is located in the riser, was in place.

The main spillway riser and impact basin were in good condition (Photographs B and C). An inspection was made of the 30-inch diameter outlet conduit. The conduit was in good condition, but some of the joints were separated. The largest joint openings were located near the axis of the dam and were approximately 1 inch.

The auxiliary spillway was in good condition (Photographs A, D, and E) except for minor amounts of brush. The previously mentioned communications line spans the spillway approach channel (Photograph D). At its lowest point, the line was at the same elevation as the top of the dam. The embankment extension (dike) downstream from the dam along the right side of the auxiliary spillway outlet channel was in good condition (Photographs E and F). The dike was partially riprapped, and the remaining portions were covered with crownvetch.

- d. Reservoir Area. Watershed slopes vary from mild to steep. Approximately one-half of the watershed is wooded, and the other half is grassland. There is only minor rural development in the watershed.
- e. Downstream Channel. The reach immediately downstream from the dam is a steep, V-shaped valley. The Village of Kingsley is located about 0.4 mile downstream from the dam. The tributary that the dam is located on joins Martins Creek in Kingsley. There are approximately 15 low-lying dwellings located in Kingsley upstream from the confluence with Martins Creek. There are also a few commercial structures along this reach.

OPERATIONAL PROCEDURES

- 4.1 Procedure. The reservoir is maintained at the crest of the orifice in the main spillway riser Elevation 1198.3, with excess inflow discharging over the main spillway and into the natural stream channel, which joins Martins Creek about 0.4 mile downstream. A 30-inch diameter concrete conduit discharges water from the reservoir. Since the 15-inch diameter, steel outlet works pipe is intended only for drawing down the reservoir, the bolted plate closure on that line is usually in place.
- 4.2 Maintenance of Dam. There is no designated caretaker for the dam. The SCC, with the assistance of the SCS, makes a formal inspection of the dam each year, and the records are filed. Maintenance deficiencies are corrected shortly after the inspection. Informal inspections are also made by the SCC several times each year.
- 4.3 Maintenance of Operating Facilities. There are no gates for the outlet works or for the main spillway.
- 4.4 Warning Systems in Effect. The SCC Representative stated that there were no emergency operation and warning plan. The condition of the dam is checked by the SCC during periods of unusually heavy rainfall.
- 4.5 Evaluation of Operational Adequacy. Maintenance of the dam is good. The procedures used to inspect the dam are good, as is the correction of maintenance deficiencies. An emergency operation and warning system is a necessary safeguard to improve the safety of the dam and prevent loss of life downstream, should evidence of stress develop at the dam.

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

- a. Design Data. The hydrology and hydraulics of the design of the dam was based on standard SCS criteria. The crest elevation of the orifice in the main spillway riser was determined by sediment requirements. The crest elevation of the drop spillway riser and the crest elevation of the auxiliary crest were set by routing 100-year storms based on SCS procedures. The design high water level was determined by routing a storm equal to 1.25 times the 100-year, 6-hour storm. The design flood was used to set the top of riprap elevation at the dike along the right side of the auxiliary spillway. The top of dam elevation was determined by routing the "Freeboard" storm, which is equal to twice the design high water storm (2.5 times the 100-year, 6-hour storm). The "Freeboard" storm is discussed in Paragraph 5.1d.
- b. Experience Data. The maximum flood that has occurred at the damsite is unknown.

c. Visual Observations.

- (1) <u>General</u>. The visual inspection of PA-467 Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.
- (2) Embankment. The slope protection on the upstream slope is dense grass. Although there is no riprap, the erosion potential due to wave action is minimal. The combination of small maximum pool (9 acres) and dense vegetal cover makes erosion unlikely. In addition, the good maintenance record for the dam indicates that any minor erosion that might occur would be repaired promptly.
- (3) Appurtenant Structures. Although joint separations in the 30-inch main spillway conduit are as large as 1-inch, the Specifications indicate that the pipe joints have a minimum extensibility of 2 inches. Therefore, the joint openings are less than the allowable

amount, and the joints should be watertight. The amount of brush in the auxiliary spillway is not significant at the present time, but control of it is necessary to insure that no reduction of spillway capacity occurs. The communications line spanning the spillway approach channel would have no effects on spillway performance.

- (4) Reservoir Area. No conditions were observed in the reservoir area or watershed that might present significant hazard to the dam. The assessment of the dam is based on existing conditions, and the effects of future development are not considered.
- (5) <u>Downstream Conditions</u>. No conditions were observed immediately downstream from the dam that would create significant hazard to the dam. If the dam should fail, a hazard to dwellings in the Village of Kingsley would exist. Because of the possibility of flooding dwellings, a high hazard classification is warranted for PA-467 Dam. The SCS designed the dam assuming that it was a Class C structure. This is essentially equivalent to a high hazard classification. Access to PA-467 Dam is adequate.

d. Overtopping Potential.

- (1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE) for the size (Intermediate) and hazard potential (High) of PA-467 Dam, the Spillway Design Flood (SDF) is the Probable Maximum Flood (PMF).
- which was used to determine the size of the auxiliary spillway and the top elevation of the dam, was not developed from PMF methods. However, the total rainfall of 24.0 inches is equivalent to a PMF rainfall for this area. The assumed losses of 3.6 inches are higher than those established by criteria for the Susquehanna River Basin, but the unit hydrograph used by the SCS is conservative. The computed peak inflow of 5,583 cfs is equivalent to a PMF peak inflow. The storm is an acceptable estimate of the PMF.
- (3) <u>Design Storm Computations</u>. The design storm computations and the spillway capacity computations are in Appendix C. It is noted that the main and auxiliary spillway combined can pass 98 percent of the

peak flow from the "Freeboard" storm without routing the flow. No routing computations were available, but since the reservoir can store about 20 percent of the runoff, it is reasonable to assume that the spillway can pass the PMF without any overtopping of the dam.

(4) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix C. Since PA-467 Dam can pass the PMF, the spillway capacity is rated as adequate.

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

- a. <u>Visual Observations</u>. Nothing was noted during the visual inspection of the dam that adversely affects the safety of the structure.
- b. Design and Construction Data. Stability analyses were performed by the SCS during the design of the dam. The results of the analyses are included in Appendix A. The minimum factors of safety were computed to be 1.41 for the upstream slope under sudden drawdown conditions and 1.56 for the downstream slope under steady seepage conditions. The factors of safety were computed using the Swedish Circle Method. The design shear strength was the consolidated undrained strength. These factors of safety are considered to be adequate.
- c. Operating Records. The reports of previous inspections indicate that no stability problems have occurred over the operational history of the dam.
- d. <u>Postconstruction Changes</u>. There have been no postconstruction changes to PA-467 Dam.
- e. Seismic Stability. PA-467 Dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone has adequate factors of safety under static loading conditions, it can be assumed safe for any expected earthquake loading. Since the factors of safety are adequate, the dam is assumed to be stable for any expected earthquake loading.

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

- (1) Based on visual inspection, available records, calculations, and past operational performance, PA-467 Dam is judged to be in good condition. The spill-way can pass the PMF without overtopping of the dam. The spillway capacity is rated as adequate.
- (2) There is a stability analysis for the embankment, and it indicates that the embankment has adequate factors of safety. There is no evidence of significant problems threatening the embankment.
- (3) The visual inspection revealed some minor deficiencies, which are summarized below for the various features.

Feature and Location	Observed Deficiencies
Embankment:	
Downstream Slope	Minor amount of brush.
Тор	Low communications line spans top.
Main Spillway:	Conduit joints separated.
Auxiliary Spillway:	Minor amounts of brush; communications line spans approach channel.

- b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.
- c. Urgency. The recommendations in Paragraph 7.2 should be implemented without delay.
- d. Necessity for Further Investigations. In order to accomplish the remedial measures outlined in Paragraph 7.2, no further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

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- a. The following measure is recommended to be undertaken by the Owner :
- (1) Remove brush from the downstream slope of the embankment and from the auxiliary spillway.
- b. In addition, it is recommended that the Owner modify his operational procedures as follows:
- (1) Develop a detailed emergency operation and warning system for PA-467 Dam.
- (2) Provide round-the-clock surveillance of PA-467 Dam during periods of unusually heavy rains.
- (3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system procedures.

SUSQUEHANNA RIVER BASIN TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

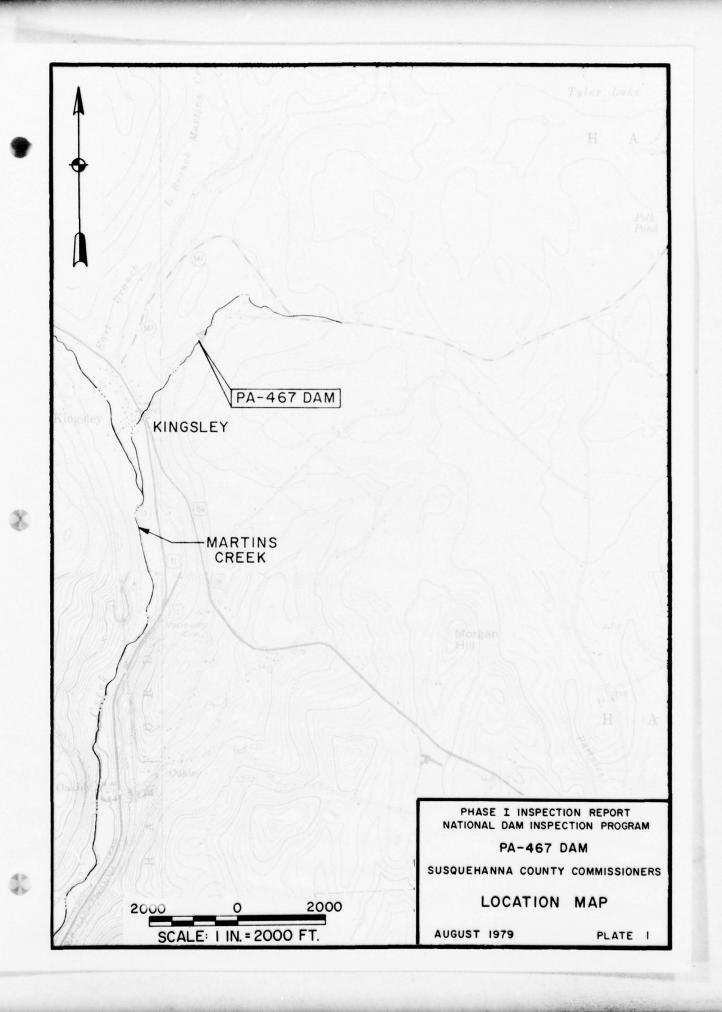
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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

PLATES



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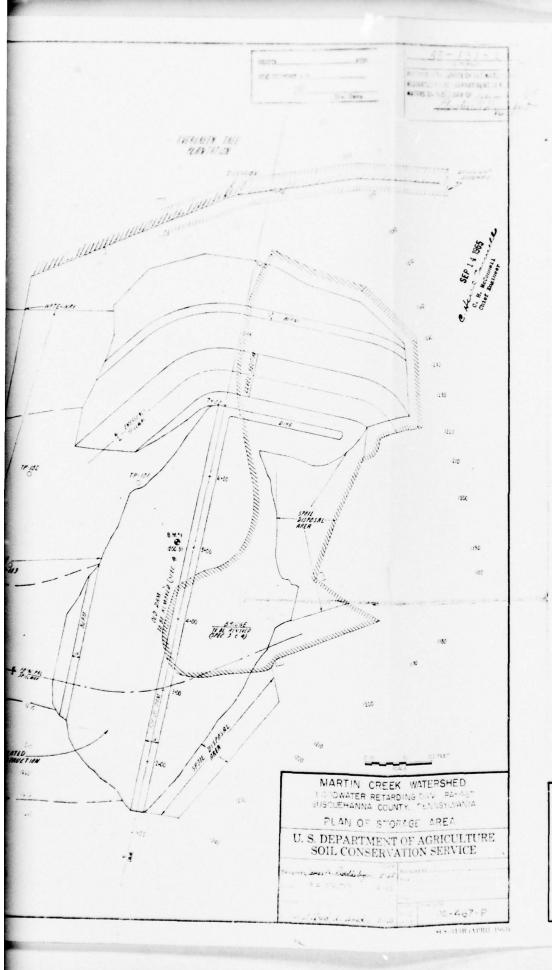
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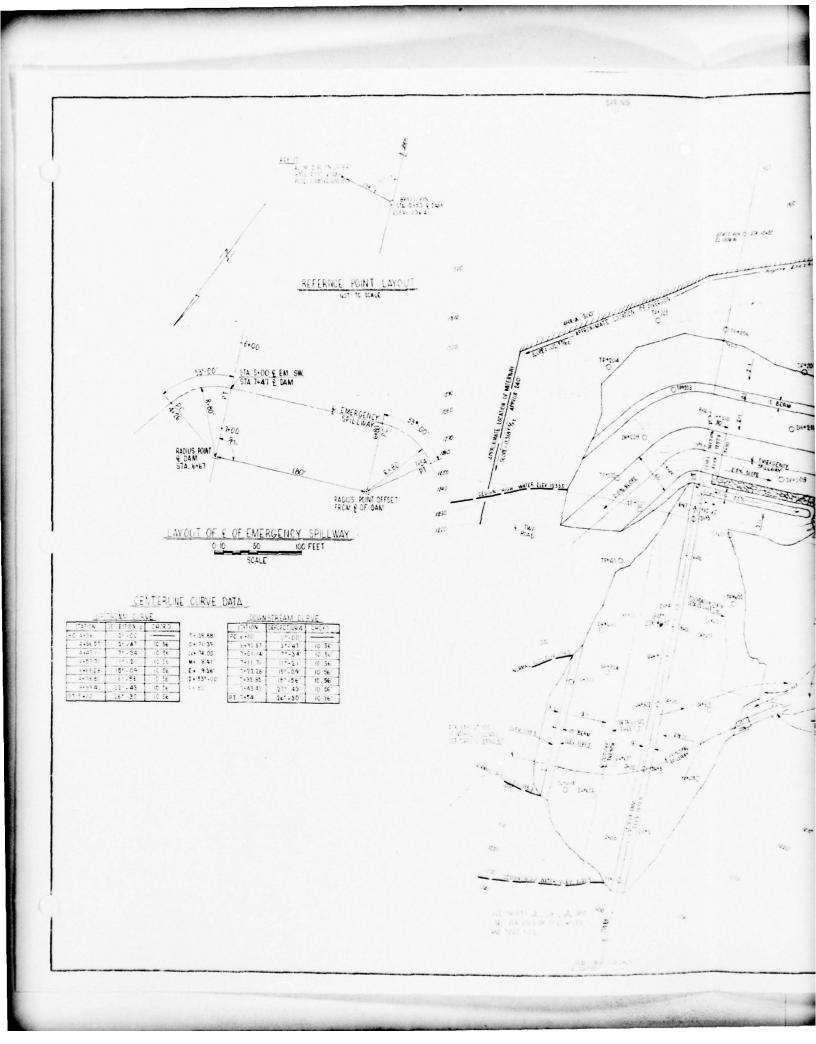
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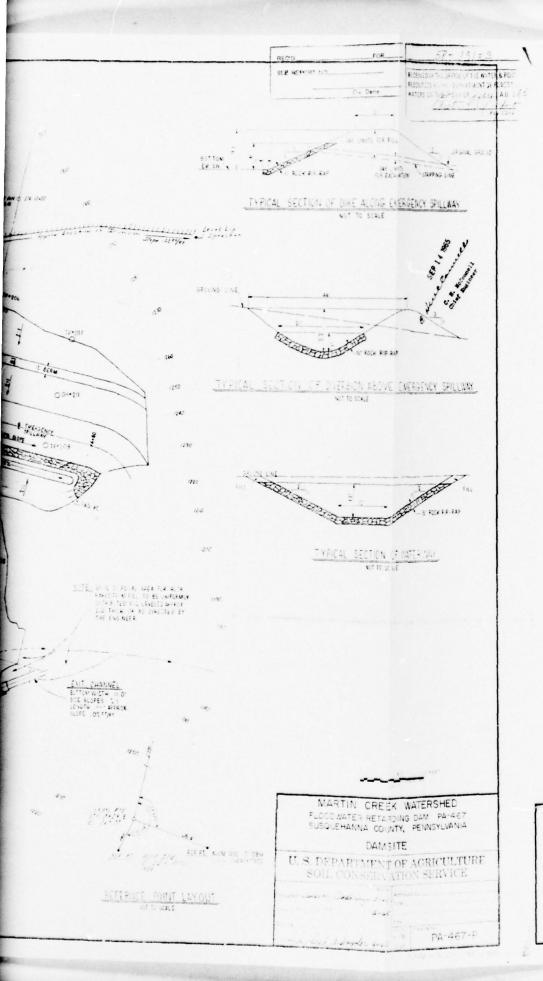
SUSQUEHANNA COUNTY COMMISSIONERS

PLAN AND TYPICAL SECTION

AUGUST 1979

PLATE 2





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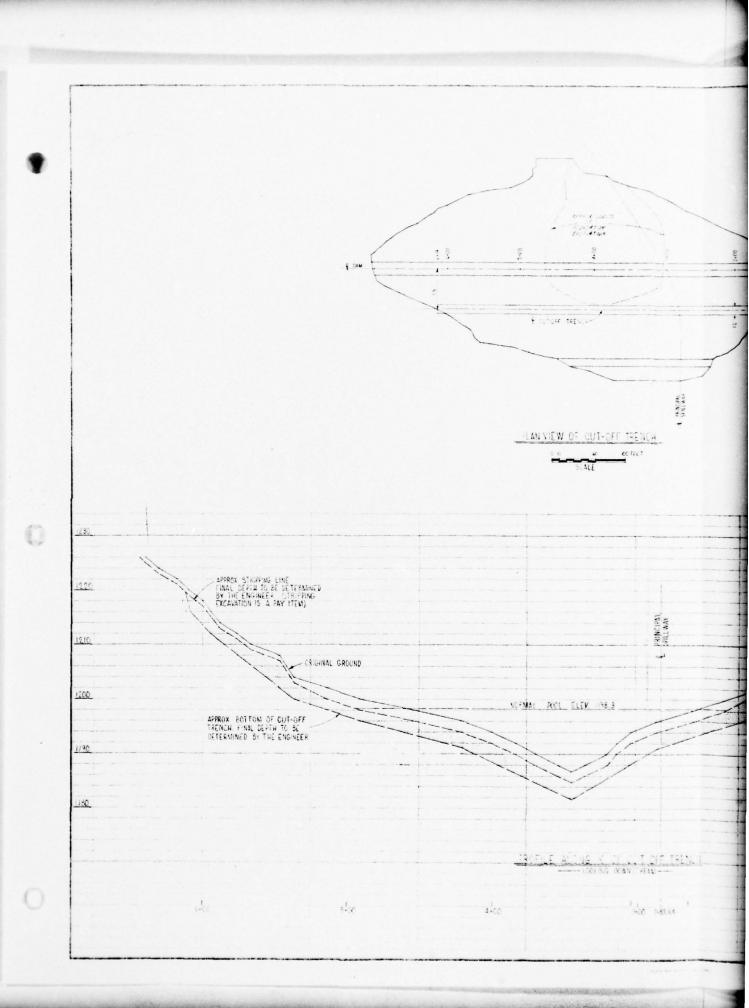
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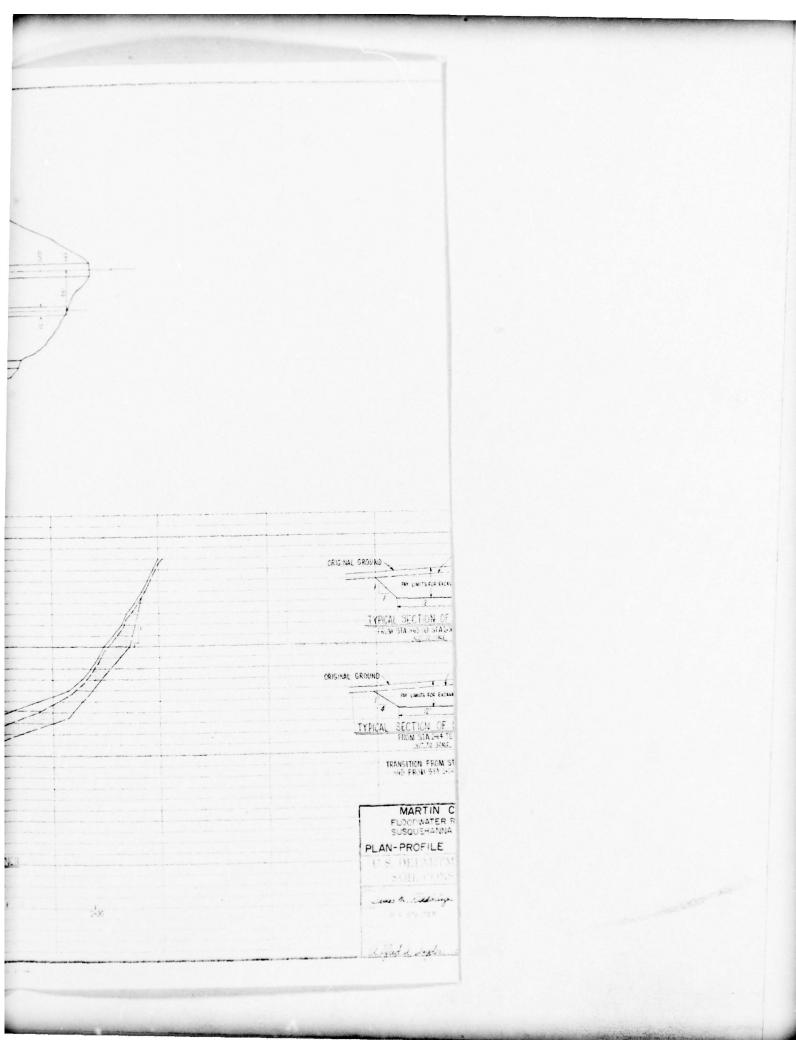
SUSQUEHANNA COUNTY COMMISSIONERS

ALIGNMENT PLAN

AUGUST 1979

PLATE 3





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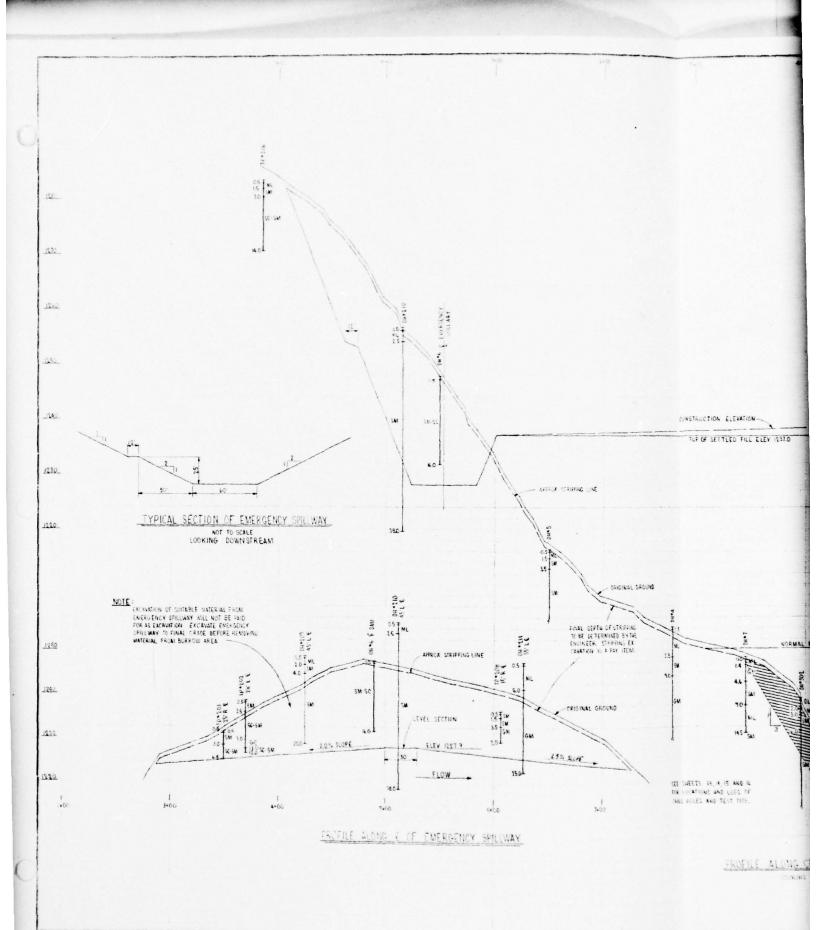
PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

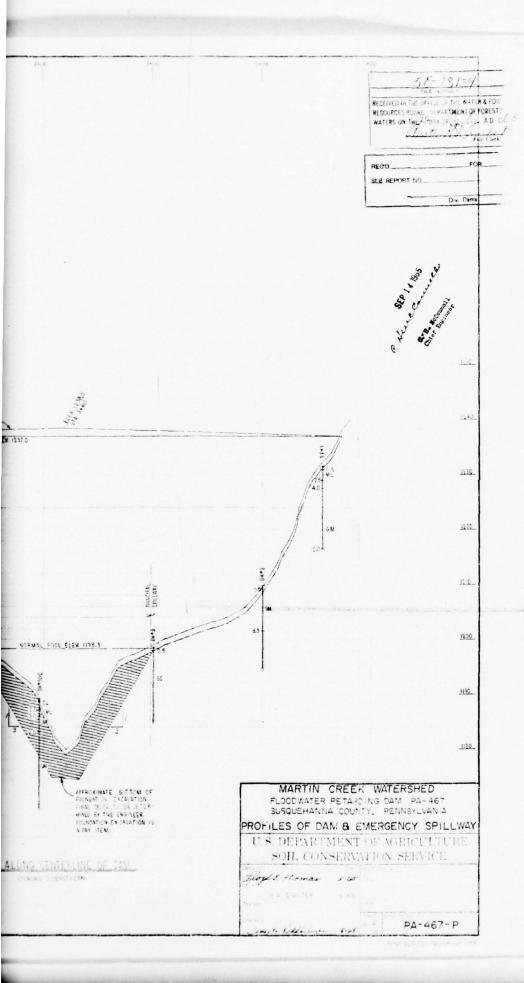
PA-467 DAM

SUSQUEHANNA COUNTY COMMISSIONERS

CUTOFF TRENCH

AUGUST 1979





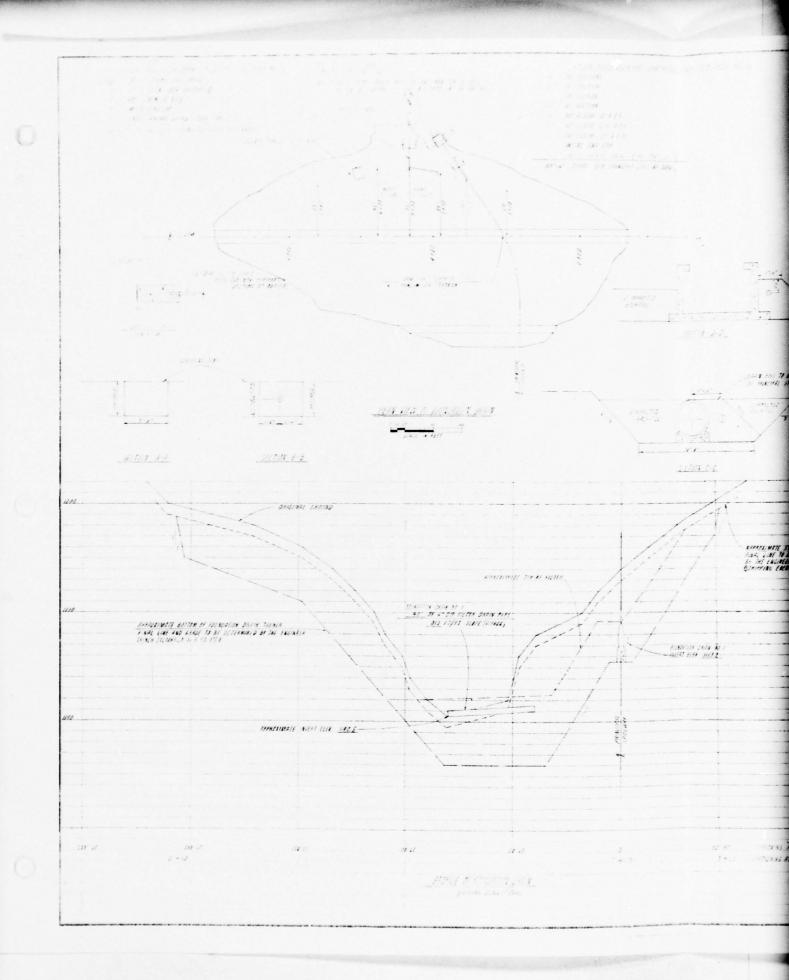
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PA-467 DAM

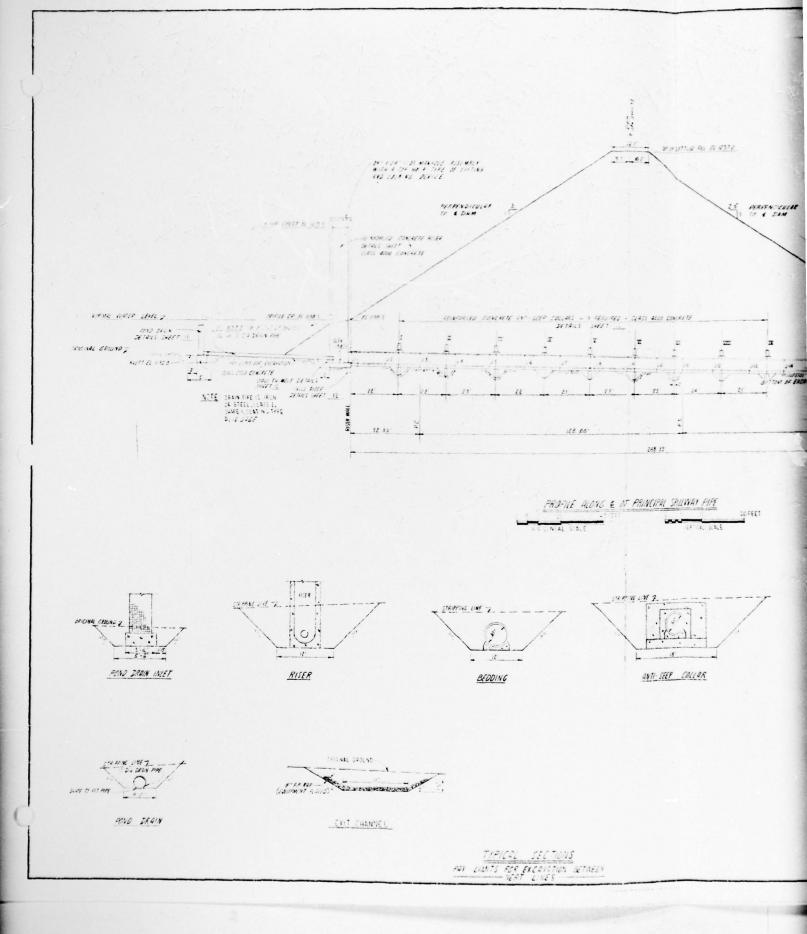
SUSQUEHANNA COUNTY COMMISSIONERS

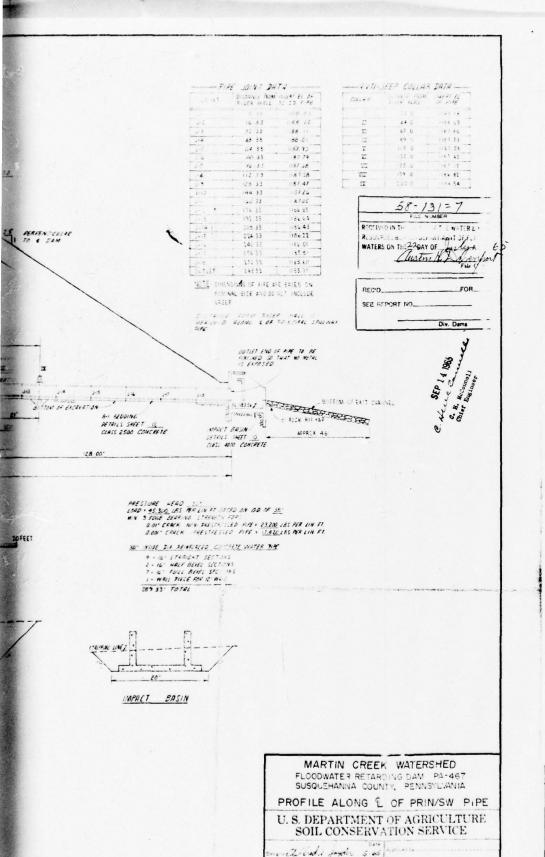
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AUGUST 1979



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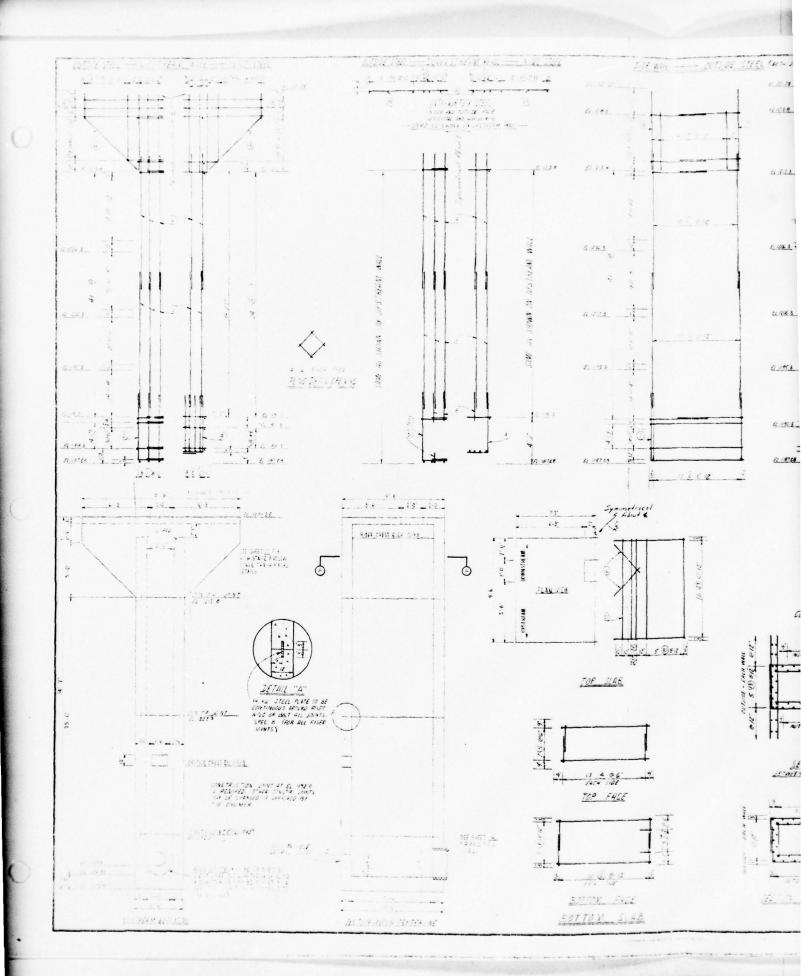
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

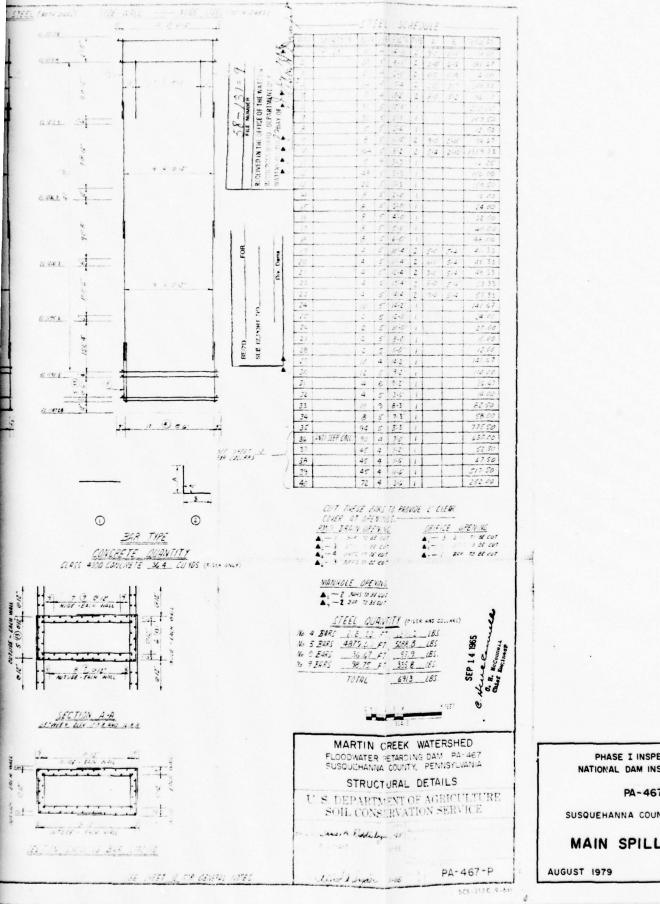
PA-467 DAM

SUSQUEHANNA COUNTY COMMISSIONERS

MAIN SPILLWAY AND OUTLET WORKS

AUGUST 1979





PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

PA-467 DAM

SUSQUEHANNA COUNTY COMMISSIONERS

MAIN SPILLWAY RISER

SUSQUEHANNA RIVER BASIN TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

SUSQUEHANNA COUNTY COMMISSIONERS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

NAME OF DAM: PA-467 Dam

NDI ID NO.: PA- 60054 DER ID NO.: 58-131

DESIGN, CONSTRUCTION, AND OPERATION PHASE I

Sheet 1 of 4

HEW	REMARKS
AS-BUILT DRAWINGS	Complete set of design drawings available. As built conditions shown in SCS files (Attached at end of this Appendix).
REGIONAL VICINITY MAP	Sec Plate 1.
CONSTRUCTION HISTORY	Constructed 1966 by Susquehanne County Commissioners.
TYPICAL SECTIONS OF DAM	See Plate 2.
OUTLETS: Plan Details Constraints Discharge Ratings	See Plates 3,7, and B. See Appending C for discharge ratings.

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Mone.
DESIGN REPORTS	Complete design folder in Penn DER files. Designed by SCS.
GEOLOGY REPORTS	Full geologic report in design folder.
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	Complete H & H computations. Stability analysis for embankment. No seepage studies available.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	Complete investigation - summary presented in Appendix E.
POSTCONSTRUCTION SURVEYS OF DAM	None.

ENGINEERING DATA

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Sheet 3 of 4

ITEM	REMARKS
BORROW SOURCES	As shown on Plate 2.
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None.
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	Nore.
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	None.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	Annual operation and maintenance inspection reports by 505.
SPILLWAY: Plan Sections Details	See Plates 3 and 5.
OPERATING EQUIPMENT: Plans Details	Available.
PREVIOUS INSPECTIONS Dates Deficiencies	1970: No deficiencies. 1971: No deficiencies. 1972: Brush piles in reservoir area. 1973: No deficiencies. 1975: No deficiencies. 1976: No deficiencies.

SOIL KECHANICS LABORATORY MAximum Section SULMARY - SLOPE STABILITY ANALYSIS

	. 0014-2411	OFO! F	AINDIE!!!			
State PENNEY	711112	Project	MARTIN	CREEK	SITE	PA-467

Date 4-8-65 Analysis Made By Checked By T.C. H

Method of Analysis SWEDISH CIRCLE

										12251
Location	Fo	und	Fou	nd.			En	76	En	26
of	-						95.9			sta
Material			ML				SC-5M	GC-GM	GA	4
Sample No.	6501	2209	1501	2055	65W	2304	1541	2903	1.501	2260
7 0		107.0		22.5	12	2.0		20.5	1	31.0
7 m								35.0		15.0
7 5		130.5		39.0	/3	9.0	1	40.0		48.0
1 b		68.0		76.5	7	6.5		77.5		95.5
Condition	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.
ф		24.0°		35,00				250		32
Tan Ø		0.445		0.700				0466		062
K										230
С		1100		950				325		0

		UPSTREAM SLOPE-	
Trial	Slope	Conditions	Fs
4	3:1	Fulldroundown-10 bermo elev 1198-Arc cut	
		from ope shill thru Emb (250-325) only	141
5	3:1	Fulldfandown-10 berm Relev. 1198-Arc cut	
		from opp shid'r thru Emb. (25.0°-325) only	1.44
6	3:1	Fulldrewdown - 10" bermæsky 1198 - Arc cut	
		fram opp shidr thru Emb. (25.0°-325) only	1.42
		/ //	

	DOWNSTREAM SLOPE		
Fs	Slope Conditions	Slope	Triel
	2:1 Drain@4b=0.6-Noberm-Arccut from app	2:1	1
143	shi'd's thru Emb (25.0°-32.5) only		
1.57	2:1 Same as # / except 10 herm Delev 1206	2:1	IA
*	2:1 Orain Q46 = 26-10' berm Epley 1206-Arc cut	2:1	2
1.53	from opp. shill'r thru Emb(250°.325) on lu		
+	2:1 Draine 4=0.6-10 Lermeley 1206-Arc cut	2:1	3
1.56	from appshid's thru. Emb (25.0°-32.5) only	-	
1	Satishear values used on all trials	-	
+	A-5		
_	A-5		

ARA . 1844 A . . 44.174

To be used to report to field offices data used for slope stability analyses and the results of the analyses. The right side of the form will be used for a aketch of the embankment on which the analyses have been made.

Continuation of Sheet 1st2
Martin Creek Site PA-467
Fransylvania

Memorandum

: Craig M. Right, State Conservation Engineer, DATE: August 24, 1966

SCS, Harrisburg, Pennsylvania

FROM : Rey S. Decker, Head, Soil Mechanics Laboratory,

SCS, Lincoln, Nebraska

SUBJECT: ENG - Pennsylvania WP-08, Martin Creek PA-467 - Construction modification in embankment zoning

> Reference is made to your phone call of August 12 and Mr. Wall's call of August 22, 1966 concerning changes in embankment design that might be required by using more material like Sample 65W23O5 from TP 109 than originally planned.

> Gradation of material represented by TP 109 and placed in a test fill, as called to Soil Mechanics Laboratory by Mr. Wall, is shown on Form SCS-353 attached. According to Wall, the test fill has in place dry density of 126.6 p.c.f. (mass) with mass moisture content of 7.4%.

> Assuming bulk dry density of the rock at 2.4 g/cc (150 p.c.f.) - the same as rock from TP 108 in the same borrow area as TP 109 - the minus No. 4 density of the test fill would be about 109 p.c.f. with 55% rock. On the basis of other samples from this site, 109 p.c.f. on the minus No. 4 would be at least 90% of maximum standard -4 density.

Samples from PA-467 have been discarded. However, the following test data from sites with similar materials are considered applicable to this site:

Penn. - Kaercher Cr. PA-477

Test Fill, mass - 7d = 125-128 p.c.f.Test Fill, minus #4 (computed) - $\gamma_d = 90$ p.c.f. approx. Max. Lab. Standard minus #4 - 7d = 120 p.c.f. Bulk density rock = 2.41-2.47 g/cc= 65-70% Larger than No. 4 Test fill specimen $\overline{\emptyset}$ = 36° Test fill specimen c = 300 p.s.f.

Virginia - Dry Run Site 102

Lab test - mass 7d = 125 p.c.f. Lab test - minus $4 \gamma_d = 94 \text{ p.c.f.}$ Max std. minus $4 \gamma_d = 113.5 \text{ p.c.f.}$ Bulk density rock
Lab. test > No. 4
Lab specimen = 2.56 g/cc= 60%= 43° Lab specimen c = 0

2 -- Craig M. Right -- 8/24/66

Rey S. Decker

Subj: ENG - Pa. WP-08, Martin Cr. PA-467 - Construction modification in embankment zoning

Virginia - Lower No. River No. 78

Lab test - mass γ_d = 126 p.c.f. Lab test < No. 4 γ_d = 94 p.c.f. Max. standard < No. 4 γ_d = 112 p.c.f. Bulk density rock = 2.55 g/cc Lab test > No. 4 = 60% Lab specimen \overline{Q} = 40° Lab specimen c = 0

Conclusions and Recommendations:

1. Material represented by Lab. sample 65W2305 from TP 109 and as placed in the test fill should have shear parameters equal to or greater than $\vec{\phi} = 35^{\circ}$, $\vec{c} = 0$ when compacted to mass densities of 125 p.c.f. or greater.

It is likely that shear parameters for this material will be about the same as for that tested on Kaercher Creek PA-477 or $\emptyset = 36^{\circ}$, c = 300 p.s.f.

- 2. Shear parameters of \emptyset = 35° and c = 0 were substituted in slope stability analyses shown in the original report for this site dated April 22, 1965. These parameters produced a minimum safety factor of 1.56 for a 2:1 downstream slope. The safety factor for the designed 2-1/2:1 downstream slope will be considerably higher than 1.56.
- 3. Material with the gradation reported by Mr. Wall and shown on Form SCS-353 (gradation run by private laboratory in Harrisburg, Pa.) should provide an almost perfect filter and drain for adjacent embankment Zone 3 represented by samples 65W2302 (TP 204) and 2304 (TP 108). No transition filter zone will be necessary between Zones 3 and 2.
- 4. All available material represented by TP 109 (Zone 2) can be used anywhere in the downstream section of the dam. It is suggested, however, that the slope of the junction between the central Zone 3 (TP 204 and TP 108) and downstream Zone 2 (TP 109) be not steeper than 0.5 horizontal to 1.0 vertical starting from the downstream shoulder of the crest and sloping upstream as shown in attached figure. (This recommendation assumes that cutoff was placed upstream from ¢ of the dam.)

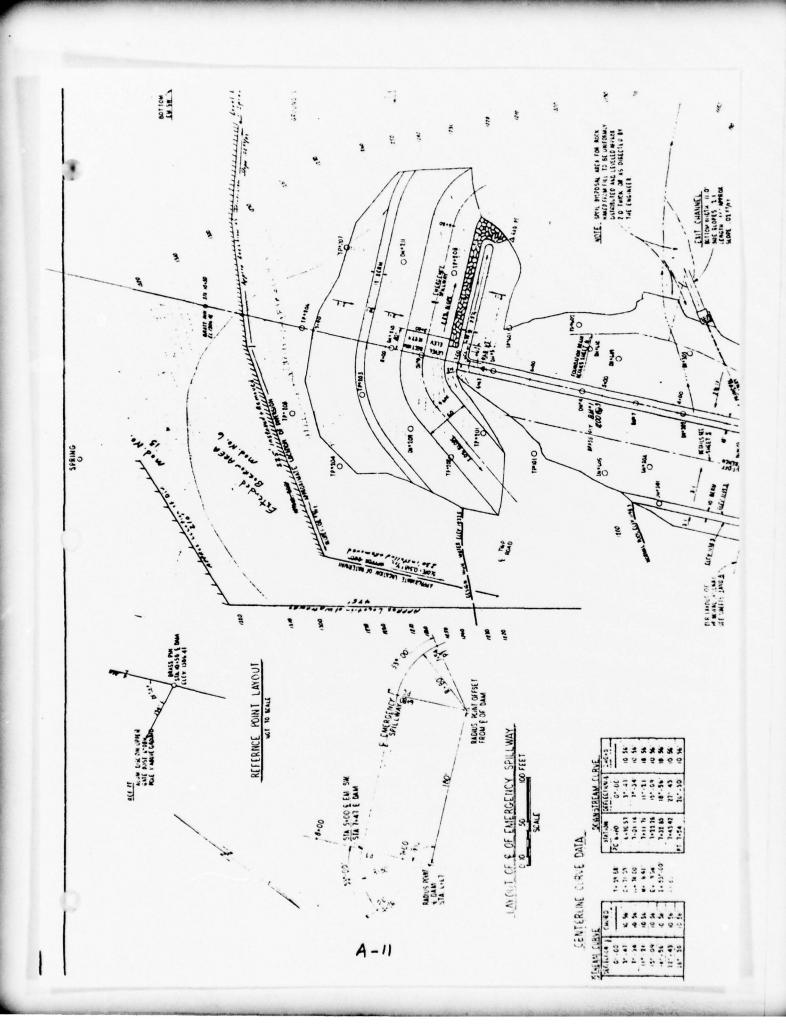
Keyd Kielin

Attachments

cc: H. M. Kautz - Upper Darby, Pa.

MATERIALS U.S. DEPARTMENT of AGRICULTURE SOIL CLASSIFICATION TESTING REPORT SOIL CONSERVATION SERVICE PROJECT and STATE POUR SAMPLE LOCATION
Frihankment Martin Cr. FIELD SAMPLE NO.
TO 119(f)
TYPE OF SAMPLE DEPTH GEOLOGIC ORIGIN DATE TESTED AT APPROVED BY DESCRIPTION Field Gradation-Zone 2 Material From Test Fill. Zone 3 original Lab. Sample SYMBOL 9/00 DRY UNIT WEIGHT 8 CONDITION 000+ 3000 (2044) 0002 (2 50) UNDISTURBED % (194) 3 11 SZ) 1060 SOLUBLE SHRINKAGE SALTS LIMIT 1151 055 (91 +) DISTRIBUTION (5.00) (611) P. P. 1000 1966 CI SIZE 02+0 ATTERBERG LIMITS USZO osza GRAIN as-16+10 1200 8 900 100 MOISTURE S FINES 100 OPENING, (mm) US STANDARD SIEVE 9000 +000 SPECIFIC GRAVITY (G_S) 6000 0 ₹. 0000 PERCENT FINER BY DRY WEIGHT ° A-9

JOB NO. 1230 1210-(TP109) ZONE 130 20 10 30 CARRY ZONE 2 MATERIAL AS HIGH AS AVAILABLE - FINISH WITH ZONE 3 MATERIAL



SUSQUEHANNA RIVER BASIN TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

SUSQUEHANNA COUNTY COMMISSIONERS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST VISUAL INSPECTION

E

PHASE I

8

iguehanna state: Renneylvania ID No.: 58-131 Hazard Category: High	of Inspection: 1198,4 msl/Tailwater at Time of Inspection: 1185,4 msl	
County: Sys	198.4 msl/Tailwater at	
Name of Dam: NDI ID No.: PA- 00054 Type of Dam: Zoned Earthfill Date(s) Inspection: 17 July 1919	Pool Elevation at Time of Inspection:	Inspection Personnel: D. A. Wolf (GECC) D. R. Ebersole (GEC.)

D.B. Wilson (GFCC) Recorder

EMBANKMENT Sheet 1 of 2

OBSERVATIONS REMARKS OR RECOMMENDATIONS	None apparent. Heavy grass cover; downstrean clope has	None.	None	Sec surrey data at end of Appendix B.	No riprap. Thick grass cover on upstream slope.
VISUAL EXAMINATION OF	SURFACE CRACKS	UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	CREST ALIGNMENT: Vertical Horizontal	RIPRAP FAILURES

EMBANKMENT

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Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	No deficiencies.	
ANY NOTICEABLE SEEPAGE	None.	
STAFF GAGE AND RECORDER	None.	
Drains	One drain outlet in stilling basin; no discharge.	Drain outlet is 6-inch dia. BCCMP.
MISCELLANEQUS	One shrub (4" \$) on down stream slope. Commonications line crosses top of dam near spillway (6 feet higher than top of dam).	Communications line has one pole on each side of top of dom. Also spans spillway approach channel.

OUTLET WORKS (MAIN SPILLWAY AND BUTLET WORKS)
Sheet 1 of 1

REMARKS OR RECOMMENDATIONS			Impact type basin.	Steep natural channel. Some large dumped rock for lining.	Could not inspect both dispect
OBSERVATIONS	Gutlet conduit in good condition. Joint separation increases progressively toward maximom section.	Concrete and metals in good condition.	No deficiencies.	No deficiencies.	No gates.
VISUAL EXAMINATION OF	CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	INTAKE STRUCTURE	OUTLET STRUCTURE (Impact Basia)	OUTLET CHANNEL	EMERGENCY GATE

UNGATED SPILLWAY (AUXILIARY SPILLWAY)

Sheet 1 of 1

REMARKS OR RECOMMENDATIONS	Gyrass - lined excavated spillway.	Communications line is at elevation of top of dam where it spans spill way approach.			
OBSERVATIONS	None.	Minor amount of brush; Communications line crosses approach channel.	Minor amounts of brush.	None.	
VISUAL EXAMINATION OF	CONCRETE WEIR	APPROACH CHANNEL	DISCHARGE CHANNEL	BRIDGE AND PIERS	

INSTRUMENTATION
Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PEZOMETERS	None.	
OTHER	Lone.	

RESERVOIR AND WATERSHED Sheet 1 of 1

REMARKS OR RECOMMENDATIONS			Undeveloped.	
OBSERVATIONS	Mid to steep.	No known problems.	Approx. 50% wooded and 50% grassland.	
VISUAL EXAMINATION OF	SLOPES	SEDIMENTATION	WATERSHED DESCRIPTION	

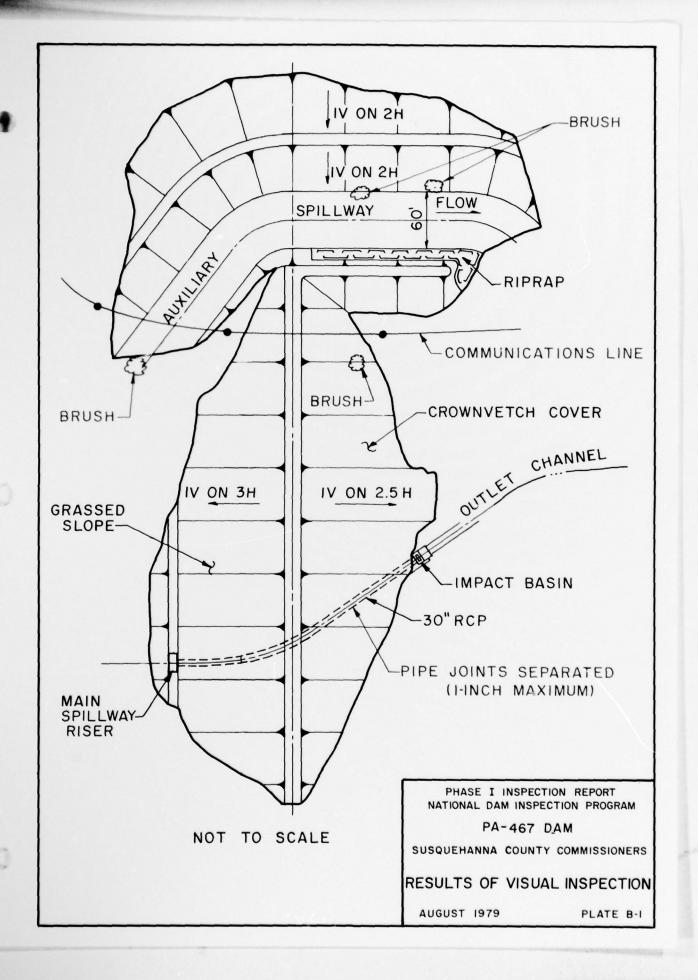
DOWNSTREAM CHANNEL

Sheet 1 of 1

OBSERVATIONS No obstructions; V-shaped valley. Steep. Community of Kingsley tocated 0.4 mile downstraam.	
A 1 prox. 15 dwellings are low-lying.	

SUBJECT PANO 467 DAM GANNETT FLEMING CORDDRY PROFILE TOP IF PAM AND CARPENTER. INC. HARRISBURG. PA. COMPUTED BY_ 1237.8 +80 END-TOP at DIAM +66 1237.9 12385 1223.3 1238.6 1233.5 1237.4 N END-TARAF DAM 1228.3 +76.5 1228.6 +20.5 1243.7 789.5 B-9 ...

SUBJECT PH. 10 467 DAM GANNETT FLEMING CORDDRY EMO SECTION & STASTOO AND CARPENTER, INC. HARRISBURG. PA. COMPUTED BY TOE of Scope SECTION @ STA 5+00 PH NO 467 DAM 0 B-10



SUSQUEHANNA RIVER BASIN TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

SUSQUEHANNA COUNTY COMMISSIONERS

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX C
HYDROLOGY AND HYDRAULICS

APPENDIX C

HYDROLOGY AND HYDRAULICS

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

- (a) There is a high hazard to loss of life from large flows downstream of the dam.
- (b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.
- (c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

19

10.18

10.64

HYDROGRAPH COMPUTATION FORM

Watershed	MARTIN CR	EEK -	State	PENNAV	Susquehanna Co.
Structure Si	te or Sub-area	PA-467"			
Storm Distr	ibution Curve _	BV	Hydro	graph Famil	y
	ibution Curve sq. mi., Pt. R				
R. O. Conditi	ion II, R.O	.Curve No.	5. Storm	Duration or	Freq. 6 hr
T _c = 0.86 h	rs., Q = 20,42	inches, T _p =	0.686 T _C =	0.59°. To	= 5.61-1:
To Compute	ed = <u>9.51</u>	To used: //	Revi	sed T _p =	0.56 hn.
$q_p = \frac{484 A}{\text{Rev. 7}}$	tp 6912	c.f.s.	ap x Q = /	1171 c.1	.s.
T (column)	$\frac{t}{T_p}$ x Rev. T_p	, q (c	olumn) = _	q _c (q _p Q)	
		Che	ck: Q = ((t) (fa)	

	Cable 3	. 21-7 (she	etof.	_)			695 A		
Line No.	titp	q _c q _p	T	c.f.s.	Line No.	t t p	$\frac{q_c}{q_p}$	T hours	c,f,s.
1	0	0.000	0	0	21	11.20	0027	6.27	383
2	ase	0.002	0.31	28	22	11.76	0012	6.59	170
3	412	003	0.63	184	23	12.52	0.006	6.90	85
4	1.68	a027	0.94	383	24	128	0.003	7.21	43
5	214	0.047	1.25	666	25	13.44	0.002	7.53	28
6	2.90	0.071	1.57	1006	26	14.00	0.001	7.84	14
7	3.36	0.115	1.88	1630	27	1456	0.000	8.15	0
8	3.92	0278	2.20	3940	28				
9	418	0.394	2.51	5383	29				
10	5.04	0.322	2.82	4563	30				
11	5.60	Q235	3.14	3330	31				
12	6.16	0.174	3.45	2466	32				
13	6.72	0.136	3.76	1927	33				
14	7.28	9110	4.08	1559	34				
15	7.84	0.092	4.39	1304	35				
16	8.40	0079	4.70	1120	36				
17	8.96	0.073	5.02	1034	37				
18	9.52	0069	5.33	964	38				
		/				-			

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AND CARPENTER. INC. HARRISBURG. PA.

GANNETT FLEMING CORDDRY SUBJECT COMPOSTIGON . SCS Freeboard Storm with PMF PA- 467 COMPUTED BY DATE_

> SCS Frueboard Storm Data: (6 hr. storm) Rainfall = 24.0 inches Runoff = 20.42 inches Peak Inflow = 5583 cfs

PMF Data for PA-467 Site: (Hydromet. 40) Index Rainfall = 22.15 inches Geographic Adjustment Factor = 95% Distribution:

> 6 hr 118% 12 hr 127% 24 hr 136%. 48 hr 142% 12 hr 145%

Hop Brook Reduction Factor = 0.80

Revised PMF index rainfall = 22.15 x 0.95 x 0.80 : 16.83 inches

Total 6 hr. rainfall = 1.18 x 16.83 = 19.86 inches Runoff from 6hr. rainfall = 19.86 - 6(.05) = 19.56 inches (Initial abstraction of 1" occurred early in PMF)

Since small watersheds (i.e. 0.8 miz) are only sensitive to peak rainfall periods, it is reasonable to compare the Freeboard and the PMF based on the maximum 6hr. runoff. Since the Freeboard Storm runoff (20.42") is greater than the 6hr runoff from the PAF (19.56") and because the SCS unit hydrograph is conservative, the Freeboard storm is an acceptable substitute for the PMF.

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	1	.5/5	1.1	10	2.24	43	1	1
4	1.5	5.6X	500	11	.37.77	100	0	
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7/	Ho	H6 12		W ₁	113/2			
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SUSQUEHANNA RIVER BASIN TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY PENNSYLVANIA

PA-467 DAM

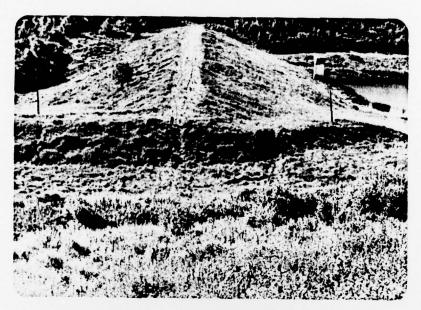
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SUSQUEHANNA COUNTY COMMISSIONERS

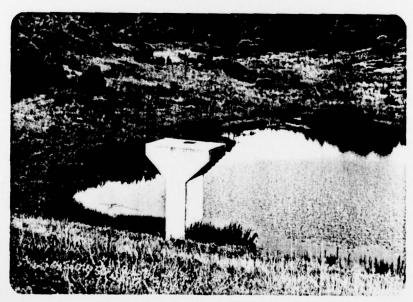
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX D PHOTOGRAPHS

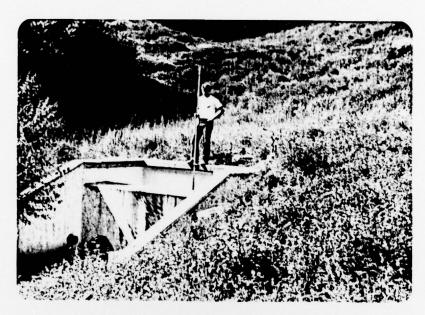


A. Embankment



B. Main Spillway Riser

PA-467 DAM



C. Main Spillway Impact Basin



D. Auxiliary Spillway Approach Channel

PA-467 DAM



E. Auxiliary Spillway Exit Channel



F. Embankment Extension Along Right Side of Auxiliary Spillway Exit Channel

SUSQUEHANNA RIVER BASIN TRIBUTARY TO MARTINS CREEK, SUSQUEHANNA COUNTY PENNSYLVANIA

PA-467 DAM

NDI ID No. PA-00054 DER ID No. 58-131 SCS ID No. PA-467

SUSQUEHANNA COUNTY COMMISSIONERS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX E GEOLOGY

PA-467 Dam

APPENDIX E

GEOLOGY

1. General Geology. The damsite and reservoir are located in Susquehanna County. Susquehanna County lies north of the Wisconsin Terminal Moraine and, with the exception of the summit of Elk Hills, was entirely covered by ice. Deposits of glacial drift of variable thickness cover the county except where they have been removed by erosion. The county is drained entirely by the north branch of the Susquehanna River and its tributaries. The Susquehanna River enters Susquehanna County from New York near the northeast corner of the County and reenters New York just north of the town of Great Bend, Pa. The river does not again re-enter the county but comes within four miles of the southwest border. As the county lies entirely north of the glacial border, there are abundant undrained areas occupied by swamps and lakes. A geologic map is presented on Plate E-1.

The rock formations exposed in Susquehanna County range in age from the Post-Pottsville of Pennsylvanian age to the Chemung of Devonian age. The youngest formations, the Post-Pottsville and Mauch Chunk, are exposed only in the southeast corner of the County. The older rocks are exposed along the western and northern boundaries.

The major structural feature of the region is the Lackawanna Syncline, which terminates in the southeast corner but whose axis turns and runs due north along the Wayne County Line. Along the west side of this synclinal axis, the strata dip steeply to the southeast. Over the next four to five miles westward, the strata flatten out to nearly horizontal. Toward Tunkhannock Creek to the northwest, the strata reverse dip on the axis of an anticline that continues southwestward as far as Union and Clinton counties. The rocks in the remainder of the county lie nearly horizontal but are folded locally into minor anticlines. The Wilmont anticline enters at the southwest corner of the county and extends across Auburn Township. Its southward dip rarely exceeds 1°, so that the strata in the southern part of the county are nearly horizontal.

Site Geology. PA-467 Dam is underlain by glacial drift and rocks of the Devonian Susquehanna group. The Susquehanna group is a complex unit of conglomerates, sandstones, siltstones, and shales. From the base to the top of this group the following changes occur in Northeastern Pennsylvania: (1) Grain size increases from bottom to top; (2) average thickness of beds increases upwards; (3) percent red color in shales increases upwards, and (4) in general, percent silica in rocks increases upwards. Bedding is usually well-developed with thicknesses up to sixteen feet in the coarser beds. Joints are generally open and dip steeply or vertical. The shales disintegrate rapidly when exposed to the atmosphere. The siltstones, sandstones, and conglomerates are moderately resistant to weathering. There are abundant swamps and lakes in the area which is characteristic of the glaciated low plateau section in which the dam is located.

Form SCS 37602 Sheet 1 of 2 For in Service Use Only

USDA-SUS

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

Siete Penna. County	Susquehanna	Watershed Martin	Creek	Subwatershed	
Site number PA-467 Site group					Det: 1/65

INTERPRETATIONS AND CONCLUSIONS

7- ----

Toundation from the centerline downstream is basically glacial till (SM) with some areas being a GM. No problems are anticipated with the till. The 2.5 feet of ML which caps the centerline in most places may be somewhat weak; however, there is very little of this material and some will be eliminated through the use of a positive cutoff. Hardpan which lies between the ML layer and the till is sufficiently impervious to act as a base for the positive cutoff since the permeability is .08 feet per day.

The and one station 4+55. Both will apparently be too soft to support the proposed height of fill at their respective locations. Consideration should be given to their removal. Undisturbed sample 7A is representative of the suried stream channel. Recovery of a sample of the present channel alluvium Trom DM 303 was not successful because of the extreme softness and wetness of terrial.

careful analysis also should be made of the upstream toe foundation.

**Oft material comprises over 13,000 cubic yards plus an additional 3-.000

**Colin yards SM overburden on each side of the existing pond. It is nonmended that the recent sediment immediately below the existing pond be proved regardless of all other considerations. Laboratory analysis of undistarbed sample 604A should give indications as to how much of the recent sediment to the right of station 3+00 needs to be removed. Remaining alluvial material under the toe can be dealt with in either of two suggested manners: (1) total removal of the soft material and backfilling with till; (2) flattening the side slopes of the proposed structure. (See also this discussion in the section on the principal spillway which follows.)

orrow

More than enough borrow is available with 66,000 cubic yards coming from the emergency spillway and 15-20,000 cubic yards from the right side of the 7001 area. No special problems are expected; all material is good. Till dry density of 131 pounds per cubic foot indicates that swelling will probably occur when removed and recompacted. This extra yardage will be offset by the appreximately 20 percent of boulders and cobbles which are present in the 200700 area (not the spillway). It is suggested that the top 0.5 feet of soil be removed to the spoil area. This leaves 1.0 to 1.5 feet of ML material which can be mixed with the underlying Hardpan layer. Many road cuts in the area show shear failures due to over-steepening of slopes. Not less than 3:1

Interpretations and conclusions Cont'd

Enamoney Spillway

hree to one slopes suggested by the design engineers appear to be adequate. No special problems in obtaining the borrow are expected. Consideration should be given to diverting the stream running down the left abutment. Since no definite channel was observed at the site itself, some of the water is percolating into the ground and emerging on the centerline in the vicinity of station 6+00 where seeps are present. Allowed to continue, this condition would eventually cause slumping in the spillway cut. Flow was not studied, but may occur most of the year since the stream source is partially from springs.

Principal Spillway

The 12.6 feet of unusually soft material lying directly on the glacial till at DM 303 will not support any weight and should be removed. Since this material extends upstream, consideration should be given to its removal throughout the proposed location of the conduit. This will leave a hump of till sticking up in the vicinity of DH 302, thus the possibility of differential settlement between DH 301 and 302. A possible suggestion would be the removal of all material down to elevation 76.0* and backfilling with more dense till. Undisturbed samples of the alluvial material (DH 305B) and the soft underlying glacial lacustrine (DH 301A) have been forwarded to the soil mechanics laboratory for analysis.

An alternate suggestion for the principal spillway location is at station.

Here the underlying till has a more even surface and the overlying erial could be used for backfilling once the alluvial material is removed.

*Relative elevation (MSL = 1176.3)

